Life history of *Bemisia tabaci* biotype B on poinsettia cultivars: do they prefer light green leaf cultivars?

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Bemisia tabaci biotype B

Euphorbia pulcherrima

Abstract

- Previous work has shown poinsettia cultivars differ in susceptibility to the silverleaf whitefly.
- Our study determines host plant cues that play a role in attracting whiteflies.
- It is hypothesized that visual cues play an important role in attracting whiteflies populations in poinsettias.
- Adult settling and oviposition was evaluated in an experiment with and without visual cues.
- It is also hypothesized that amino acid profile and morphological traits such as specific leaf area, chlorophyll content and trichome density, content are factors affecting host choice by *Bemisia tabaci* biotype B.
- Adult settling and oviposition preference by the silverleaf whitefly is significantly affected by the presence of visual cues. A strong preference is observed for light green leaf cultivars.
- Light green leaf poinsettias differed in the amino acid profile compared to dark green leaf plants.
- In addition, specific leaf area and chlorophyll content differs between the light and dark green leaf cultivars.
- Trichome density did not differed among cultivars.
- Visual, chemical and physical characteristics play a role in whitefly host selection.

Introduction

Ohio is the fifth largest producer of poinsettias (*Euphorbia pulcherrima*) in the nation and poinsettias, known as the Christmas flower, are the number one potted ornamental sold in the United States.

My research focuses on the study of plant factors that can limit and/or ameliorate the feeding by the number one insect pest attacking poinsettias, the silverleaf whitefly (SLWF), *Bemisia tabaci* biotype B.

Background: Previous studies indicate poinsettias cultivars with dark colored leaves (Freedom) are less favorable to the SLWF affecting whitefly survival, oviposition, and adult settling compared to light colored leaf (Monet) poinsettias.

• To further investigate if Freedom plants are less attractive to whiteflies as a result of visual stimuli a visual cues choice experiment was conducted without visual stimuli (in darkness).

• Other traits such as specific leaf area (SLA), chlorophyll content, trichome density, and amino acid profile were measured as factors influencing whiteflies' host choice.

Objective: find characteristics in poinsettia plants that confer resistance. Ultimately, understanding the mechanisms of resistance, which could be physical or chemical properties within the plant, will enable us to implement "environmentally-friendly" measurements to control this pest.

Hypotheses:

1. Visual cues play an important role in whiteflies host choice. Light green leaf poinsettias will be preferred by whiteflies when given the visual stimuli than dark green leaf cultivars.
2. Light green leaf cultivars will differ in SLA, Chlorophyll content, trichome density, and amino acid profile compared to dark green leaf poinsettias.

Methods

1) Visual cues experiment : conducted in the dark for 48 h in a growth chamber with temperature 24 °C and 60 % relative humidity.
A choice test of one **Freedom** leaf (dark green leaves) and one **Monet** (light green) leaf placed inside a cage where 80 pairs of whiteflies were released (n=3).

Measured: adults settling and oviposition.

2)Determine visual differences between light green leaf versus dark green leaf cultivars.
Chlorophyll content in the leaves. Minolta SPAD 502 chlorophyll meter (n=10)

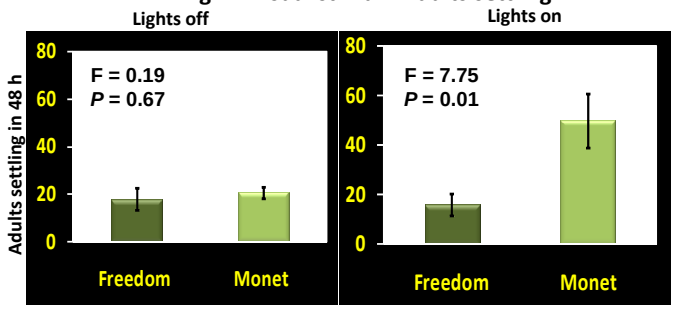
3)Morphological traits associated with insect resistance(Poorter & Garnier 2007) :
Specific leaf area (SLA): ratio of leaf area to leaf dry mass (n=10) based on methodology of Vile et al (2005).
Trichome density: counted in a area of 25 mm^2 (n=8).

4)Amino acids: free soluble amino acids were extracted in HCL 0.01 N from petioles of leaves; analyzed in GC-Mass Spec after derivatization using the physiological EZFAAST kit (Phenomex, Inc.).

Data analysis: Complete block design via ANOVA (SAS). Contrasts for mean separation analysis of trichome density, SLA, SPAD, oviposition, and adult settling (α=0.05).

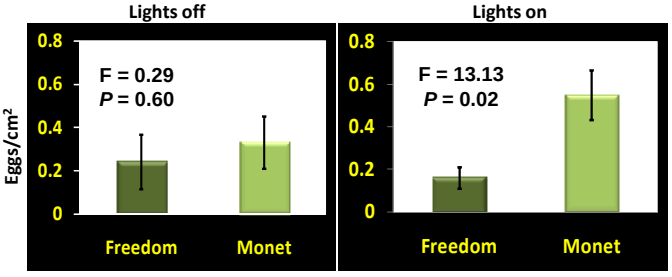
Results

Fig. 1. Visual stimuli: Adults settling



Visual stimuli plays a role in the adult settling choice of whiteflies.
Significantly more adults preferred the light green leaf cultivar Monet when in presence of visual stimuli (lights on).

Fig. 2. Visual stimuli: Oviposition



Visual stimuli plays a role in the oviposition host choice of whiteflies.

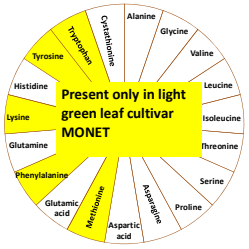
Significantly more eggs were oviposited in the light green leaf cultivar Monet when in presence of visual stimuli (lights on).

Table.1 Contrast of traits between a dark green leaf (Freedom) and a light (Monet) poinsettia cultivars [1]

Cultivars	Trichomes 25 mm^2	SLA [2] (cm^2/g)	SPAD [3]
Freedom	325.88	320.66	38.92
Monet	388.81	269.75	22.05
F	0.03	18.96	74.92
P-value	0.8545	0.0004	<0.0001

[1] Traits are means of n=8, n=10, n=10, respectively.
[2] SLA= specific leaf area indicates the thickness of the leaf the more cm^2/g the thinner it is and possibly more susceptible.
[3] SPAD=number indicating the relative amount of chlorophyll in the leaves.

Fig. 3. Amino acid profile for dark and light green leaf poinsettia cultivars: Freedom/Monet



Conclusions

- **Visual stimuli plays a key role in the silverleaf whitefly adult settling and oviposition host preference in poinsettias (Figs 1 and 2).**
- **Thinner leaves in light green leaf poinsettias may contribute to its susceptibility to the silverleaf whitefly (Table 1).**
- **Amino acids present only in light green leaf cultivars may also be a key element affecting the preference of whiteflies (Fig. 3). Further research is under way in this area.**
- **Trichome density appears not to play a role (Table 1) in adult settling and oviposition host preference by the silverleaf whitefly.**

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